



Challenges in Face Recognition: A Review

Satonkar S.S.*

Department of Computer Science,
Arts, Commerce and Science College,
Gangakhed, Dist: Parbhani (M.S.), India,
prb_suhas@rediffmail.com

Kurhe A. B.

Department of Computer Science,
Shri Guru Buddhiswami College,
Purna, Dist: Parbhani (M.S.), India,
ajay.kurhe@rediffmail.com

Dr.Khanale P.B.

Dnyanopasak College, Parbhani, (M.S.), India,
prakashkhanale@gmail.com

Abstract: Face recognition is one of the most relevant applications of Image analysis. It's a true challenge to build an automated system which equals human ability to recognize faces. Face recognition is an unsolved problem and a demanded technology. Face recognition is also useful in human computer interaction, virtual reality, database retrieval, multimedia, computer entertainment, information security e.g. operating system, medical records, online banking., Biometric e.g. Personal Identification - Passports, driver licenses , Automated identity verification - border controls , Law enforcement e.g. video surveillances , investigation , Personal Security – driver monitoring system, home video surveillance system. In this paper we have presented about a face recognition system and challenges that are very complex. Finally we describe the future research directions of face recognition

Keywords: Face Recognition, Image Processing, Pattern Recognition, Face Verification, Face Identification.

I. INTRODUCTION

Face recognition systems have been conducted now for almost 50 years. The first Paper talking about face recognition can be traced back to the 1950's in psychology [1]. The first work concerning automatic face recognition was done in 1970 by Kelly [2]. The challenge for a face-recognition system is to be able to mimic this ability with at least an equivalent measure of accuracy, if not better, with smallest interpenetration. Face recognition technologies are usually used in verification, identification and watch list.

A. Verification:

Confirming whether a person is who he / she claim to be. A recognition system determines if the person in a face image in Indian database and matches a Claim Identity see figure 1.

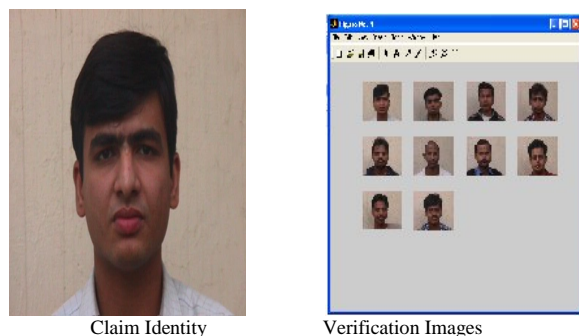


Figure 1 Claim Identity & Verification Images in Indian Database

B. Identification:

Matching unknown faces taken from supervision recording with images in a database. A recognition system

determines the identity of a person in a face image see figure 2

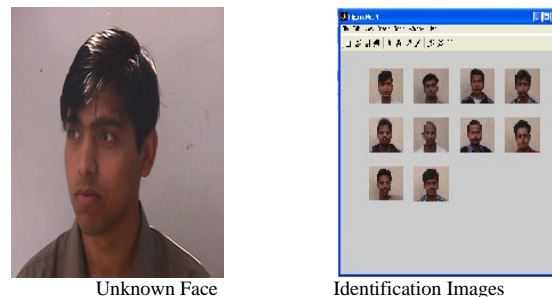


Figure 2 Unknown Face & Identification Images in Indian Database

C. Watch list:

A recognition system first determines if the person in a face image is on a look at list and, if yes then identifies the individual see figure 3

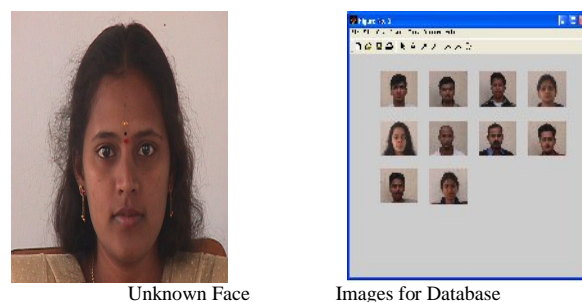


Figure 3 Unknown Face & Images for Database in Indian Database

The difficulty of the identification and watch list scenarios depends on the size of the database.

II. FACE RECOGNITION SYSTEM

Face recognition system consists of three modules shown in figure 4. The Input of face recognition system is input image the output is identification or verification of the subject or subjects that appear in the input image. Face detection and feature extraction run simultaneously. The next step feature extraction involves obtaining relevant facial feature from the data. These feature could be certain face region, variations, angles or measures which can be human relevant or not. Finally the system does recognition the face.

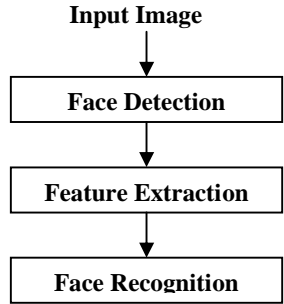


Figure 4 Face Recognition Systems

Why Face Recognition is Challenge

Images of human faces undergo many changes due to acquisition conditions and natural aging. Acquisition conditions refer to the pose of the face with respect to the camera, illumination conditions, facial expressions and the number of pixels in the face region. Additional variations may be caused by disguises, occlusions (due to sun glasses, baseball hats, etc) and gain/loss of weight and facial hair. As part of aging one may undergo weight gain or loss, thus adding another dimension to the variations in human faces. Although the person is the same, the range of faces images can be very large. The challenge of face recognition task is to be able to recognize a person in the presence of all these variations.

III. CHALLENGES IN FACE RECOGNITION

A. Pose Variation:

Comparing faces under varying pose is another fundamental challenge for face recognition system. Some unavoidable problems appear in the variety of practical applications such as the people are not always frontal to the camera, so the pose problem is a big difficulty for the face recognition system to be occurrence. In essence, the difference between the distinct persons under the same poses, it is difficult for the computer to do the face identification when the poses of the query and gallery images are different. Pose variation still presents a challenge for face recognition.

Frontal images have better performance to novel poses than do non-frontal images. The recognition rates of frontal images are greater than non-frontal images See figure 5.

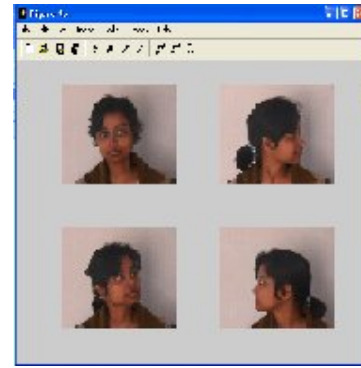


Figure 5 various view of face images with different face pose variations in Indian database

B. Occlusion:

The face recognition context, it involves that some parts of the face can not be obtained. e.g. a face photography taken from a surveillance camera could be partially hidden behind column. The recognition process can rely heavily on the availability of a full input face. Therefore, the absence of some parts of the face may lead to bad classification. There are also objects that can occlude facial features sun glasses, hats, beards, certain hair cuts etc see figure 6.

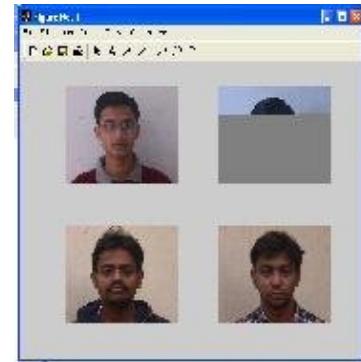


Figure 6 various view of face images with different face occlusion in Indian database

C. Expression:

Comparing faces with different facial expression is another problem for some face recognition applications. Faces undergo large deformations under facial expressions. Human can easily handle this variation, but the algorithms can have problems with the expression databases. Face recognition under extreme facial expression still remains an unsolved problem, and temporal information can provide significant additional information in face recognition under expression. The performance of face recognition system significantly decreases when there is a dramatic expression on the face. Therefore, it's important to automatically find the best face of a subject from the images.

Using the neutral face during enrollment and when authenticating, so that we can find the neutral face of the subject from the six universal expression like Happiness, unhappiness, anger, horror, surprise. See figure 7.



Figure 7 various view of face images with different face expressions in Indian database

D. Illumination:

Comparing two faces with different illumination is one of the fundamental problems for face recognition system. Face images of the same person can be taken under different illumination conditions such as, the position and the strength of the light source can be modified like the ones.

E. Aging:

Face recognition across aging is most challenging in that it has to address all other variants as well. Pose expression and illumination changes are bound to happen for two images of a person taken years apart. In addition to this, textural properties of the skin can be different as well makeup, eyeglasses, weight loss/gain, hair loss, etc. The facial changes that occur due to aging are influenced by numerous environmental factors like solar radiation, smoking, drug usage, stress level, etc. The different biological and environmental factors can either delay or expedite the process of aging. Aging results in changes in both the hard and soft facial tissue of an individual. Loss of tissue elasticity and facial volume and alteration in skin texture are some of the other changes with aging. Drifts in facial landmarks appear to reasonably characterize the shape variations associate with aging, especially in ages 2-18.

F. Transformations:

The same face can be presented to the system at different scales. This may happen due to the focal distance between the face and the camera. As this distance gets close the face image gets bigger. Head orientations may change due to translations and rotations.

IV. CONCLUSIONS SCOPE FOR FURTHER RESEARCH

It is our opinion that research in face recognition is an exciting area for many years to come and will keep many scientists and engineers busy. In this paper we have given concepts of face recognition system and problems that are very complex and common namely face recognition.

The website www.face-rec.org holds a list over recently released work and also a list with links to different research groups. The future of face recognition systems looks intelligent, there is over 50 groups spread around the world working on the issue today. The present paper can provide the readers a better understanding about face recognition system and its problems or challenges and the topic is open to further research.

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VI. REFERENCES

- [1] Bruner and R.Tagiuri, The perception of people, pages 634-654. Addison-wesley, Second edition, 1954.
- [2] M. D. Kelly. Visual identification of people by computer. PhD thesis, Stanford University, Stanford, CA, USA, 1971.
- [3] W..Zhao, R.Chellappa, P.J..Phillips and A. Rosenfeld, "Face Reconition: A literature Survey. ACM Comput.Surv., 35(4): 399-458, 2003.
- [4] Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, "Digital Image Processing Using MATLAB", Pearson Education ,ISBN 978-81-7758-898-9
- [5] Shang-Hung Lin, "An Introduction to Face Recognition Technology", Informing Science Special Issue on Multimedia Informing Technologies-Part 2 , Volume 3 No 1, 2000.
- [6] Digit Maxine, September 2009,Page No.62-63.
- [7] Roberto Bruunelli and Tomaso Poggio, Face Recognition:Features versus Templates, IEEE Transactions on Patten analysis and Machine intelligence Vol.15.No.10, October 1993.
- [8] J. Huang, B. Heisele, and V. Blanz. Component-based face recognition with 3d morphable models. In J. Kittler and M. S. Nixon, editors, International Conference on Audio- and Video-Based Biometric Person Authentication (AVBPA-3), volume 2688 of Lecture Notes in Computer Science, pages 27-34,Survey, UK, 2003. Springer.
- [9] Matthew A. Turk and Alex P.Pentland, "Face Recognition Using Eigenfaces", Vision and Modeling Group, The Media Laboratory Massachusetts Institute of Technology, CH2983-5/91/0000/0586/\$01.00 1991 , IEEE.
- [10]Shang-Hung Lin, "An Introduction to Face Recognition Technology", Informing Science Special Issue on Multimedia Informing Technologies-Part 2 , Volume 3 No 1, 2000.
- [11]Kailash J.Karande, Sanjay N.Talbar, "Face recognition under Variation of Pose and Illumination using Independent Component Analysis", ICGST-GVIP, ISSN 1687-398X, Volume (8), Issue (IV), December 2008.
- [12]Srinivasulu Asadi, Dr.Ch.D.V.Subba Rao,V.Saikrishna "A Comparative study of Face Recognition with Principal Component Analysis and Cross-Correlation Technique", International Journal of Computer Applications (0975 – 8887), Volume 10– No.8, November 2010.
- [13]Eimad E.A.Abusham, Andrew T.B.Jin,1Wong E.Kiong and 2G Debashis, "Face Recognition Based on Nonlinear Feature Approach", Ammerican Journal of Applied Sciences 5(5): 574-580,2008.
- [14]Aditya Nigam,Phalguni Gupta, "A New Distance Measure for Face Recognition System", 2009 Fifth International Conference on Image and Graphics.

[15] FaceIt. <http://www.identix.com>